

**Multi-signal device for vehicle, comprising a light-emitting core**

The present invention refers to a multi-signal device applicable to a rear-view mirror of a vehicle placed inside a housing, in a part thereof or in a lid of said housing; comprising at least a light source consisting in a support module or light unit (Z) including several LED's in a simplified circuit with conducting tracks printed on both faces or alternatively two parallel circuits joined by their sides opposite the ones having conducting tracks, or one preformed core including metallic tracks printed or dice-cut where the LED's are inserted facing outwardly and in opposite directions and/or reflective means, so that the emitting direction of said LED's or by means of the reflective means employed (S1), in opposite directions of the focus 1 (F1) and the focus (F2) which are approximately diametrically opposed, provide an exit of the light through a transparent cover of high brightness through a shadowless transparent perimetrical band, the light being in part direct or in part reflected by a metalized collimator or internal elongated parabola, said solutions being applicable to other parts of the vehicle.

This light emitting core (Z) comprises also depending on the exit light angle wished, a sandwich of at least two interconnected circuits each of them equipped with corresponding LED's, inserted, attached or bonded to a core of a good heat conductor material, with longitudinal openings that allow circulation of air helping in the cooling, the resulting external faces of the light unit being or not parallel, separating from an axis between  $0^\circ$  and  $\pm 90^\circ$  from a lower or upper apex (XL) with the aim of the light emitting focus of each LED or circuit opening be duly positioned in such a way that part of the light is reflected inside a parabola of the device, at least one time before passing through the transparent covers preferably colorless or slightly tinted in a fume, light blue, watery green, whitish or orange tint, among other tones.

The device produces at least one intermittent turn signal that is yellow-orange, with the resulting emission for the rotation signal being between 400 and 620 nanometers, although the transparent cover is colorless, with a light output visible from the front section, the side and the rear of the vehicle, covering an angle to the rear of more than  $60^\circ$  with respect to the circulation axis taking  $0^\circ$  as reference in a simultaneous fashion and projected onto a

horizontal plane from a salient point of the rear view mirror farthest away from the bodywork, not visible to the divers, or if it is visible, not disturbing because the light focus is aimed by the necessary optic means from its output end backwards in an angle that is different to the location of the driver's eyes. Based  
 5 on two planes, which are the external and internal surfaces of the transparent cover adjacent to the light to the rear, it is possible to change the light direction with the necessary convergence according to the angle of incidence and the light output through it.

The device produces another permanent white signal, visible from the  
 10 front and equal for the other beams or other colors, such as yellow, blue or green, which are used to determine two illuminated traces at the sides of the vehicle, from infinity (to the front) to the side ground close to same and allows the vehicle width, as seen from the front, to be distinguished, where the various light beams are progressively added or removed, covering the lighted zone  
 15 acting as the unfolding of a light-emitting fan, with this progressive lighting being controlled in several ways.

These signals, within the same device, with one or more transparent light output windows, or structured into separate modules, one for each signal, provide several operating combinations:

20 A. Frontal signal that lights up infinity to the front, together with the light that lights up the side ground, both white or yellow and with alternating lighting and/or progressive, summing one light beam to another, according to the needs and application and according to the automatic commands and controllers.

25 B. Turn signal, together with a different colored frontal signal, both located below the same transparent cover, without the progressive part.

C. Turn signal, together with the lateral zenith light and with the same transparent cover that does not illuminate infinity in front of the white light.

30 D. Complementary signal or light that illuminates the field of view of the adjacent chamber oriented to the front or side, of any type, digital or analogue, that the unit incorporates inside or outside the same.

All these devices avoid the steaming up and the condensation it incorporates obtaining more brightness and clarity in the transparent cover

because they incorporate a second transparent plate being thinner than the outside transparent cover, an air chamber being created by a gap of at least 0.1 mm between said transparent cover and plate, this latter being gripped around the whole perimeter between the transparent cover (1) and the reflector (2).

- 5 Another form to prevent the steaming consists in using an inner sheet, cover, lacquer or film being athermal and/or made of a material having a heat conduction being different from that of the transparent cover.

This piece (30) is smooth and can partially integrate optical elements like lens or prisms slightly tinted in a light blue fume, green, orange or whitish color.

- 10 Another novel way of providing more brightness and clear said transparent cover is to prevent the formation of a dark perimeter generated by the exterior vision of shadows produced by the unequal adaptation to the part containing it, in addition to preventing direct view of the edges of the weld between the plastic parts that make it up, consisting of covering up the weld  
15 under the casing edge and creating a perimeter band on the transparent cover without any shadows by means of its two surfaces, interior and exterior, with the interior surface being the most parallel possible in relation to its exterior homonym.

- The progressive signal module can be constructed as an external module  
20 for application to various rear view mirrors in an externally added manner, but to obtain better termination and installation. These devices, together or separated, with one or two functions can be fitted to various rear view mirrors without the need for the casing to be made with an aperture to house them, since said aperture or window is obtained using precision laser system cutting, or high-  
25 pressure water jet, programmed so that it can produce a series of several units. Said modules are secured by internal self-adhesive strips along the perimeter inside the rear view mirror in case clips or turrets for the screws, as they are normally secured, are not available.

- The light-emitting circuit or core is supported on a small cover with a  
30 substantially flat welded edge that facilitates and ensures a good weld and is also fitted with cooling fins. The support is made of a material that helps to

transmit heat, such as metal or plastic with charges or resin and is combined with at least one orifice to prevent the entry of water by gravity or pressure.

Since the circuit has a double side, it allows larger areas for the traces adjacent to the welded points, which improves heat dissipation. In addition to  
5 being printed, said traces can be made of die-cut and/or stamped metal and adhere to the core by clips and riveted by ultrasound.

Because it is quite rigid, said core facilitates installation stability, secured in place by clips, teeth, guides, hot-stamping, ultrasound or adhesive, facilitating the exit of the cables, usually with a rubber trim of a connector direct to pins  
10 inserted into the same circuit.

The LEDs may be of different types and optics depending on the zone to illuminate and are located at a rather external point, close to the transparent cover to improve the light output in one or the other directions and, for enhanced light power, an encapsulated multi-chip can be employed, which  
15 comprises various LED chips grouped on a support, or directly on at least one of the circuit board faces or the same board or PCB, with the corresponding optics or transparent protection.

The circuit may be for symmetric usage, so that it can be used equally on both the left and right sides of the vehicle.

20 The circuit in an exemplary embodiment will only have LEDs on one of the faces and will use the other face for heat dissipation.

The cited light-emitting core can be, in turn, inserted or plugged into another circuit or base support for this purpose on the side opposite the point where it has the LEDs, it has welded beams or traces for connection or for  
25 retaining, welded or secured to the second circuit, which is made of fiber glass, bakelite, a printed tape of polyester or similar, or a flat cable and/or is made of soft, die-stamped metal sheet traces, which are bent with housings that retain at least one or more cores under pressure, such as a unit module that can be repeated.

30 For a stable connection on including a circuit in another, said core would be preformed, or injected, or it would be a metal core or die-stamped sheet. Its base insertion part can have a wider section in the form of an "L" or "T" so that it

facilitates its insertion into the second circuit, in this way, it would also be possible to install a series of cores in parallel.

Another way of orienting the light for the intermittent signal from a core or point next to the critical end due to the lack of space in the light output zone to the rear and for alternative power supplies is by a reflector body interposed between the LED or lamp power supply and the transparent cover, which produces a back-reflection, either symmetric or asymmetric depending on what is allowed by the rear view mirror's curved zone geometry where the light is emitted and which, in turn, is reflected by the parabola for the second time, with part of the signal reflected towards the F1 functional zone to the front and the other part to the F2 functional zone, to the sides and rear. Said back-reflector has an approximate "Y" or "T" shape extending towards the sides of its fins and may or may not have several partial perforations to facilitate the light output towards the front dark zone.

Said reflector is metalized as is the rest of the reflector and may form part of it or not. As an alternative it is proposed to use a partial optical reflection on the interior face of a transparent body, which may be independent or form part of some of the transparent cover surfaces. In both cases, the reflection surface has an approximate inclination of  $45^\circ$  with respect to the focal centre of the light generating element, which would be in a core or flat circuit at the bottom of the assembly body.

#### State of the art

Various rear view mirrors are known that incorporate one or more light-emitting modules in their casing for the purpose of facilitating vision in the lower areas of said mirrors and vehicle sides, of the indicators, and that of the front signal or sidelights.

As a result of a search conducted in the field taking into account words such as circuit, LED, foldable circuit, combined with terms such as rear-view, mirror, etc., and taking into consideration the most pertinent US class 362/494, 362/540, 362/545, 362/800, 340/475 and International classes B60Q 1/26, B60R 1/06, B60R 1/12, B60Q 1/26, B60Q 1/34, B60Q 1/38, F 21W 101/12, the most relevant documents discovered are following detailed:



US 2001/0010633 A1, AGO-2001; DE 20001 407 U1, and US 2003/0168247 A1, Reitter & Schefenacker, relate to a manufacturing and over-injecting system of a conductor film with LEDs which are inserted in order to generate a radial light below a transparent cover with optics or which form several repeated "V"-shaped rays which enter a parabola. This system's difficulty lies in the fact that such a circuit is quite large and expensive. Other disadvantages include the inner body of the device being the same as the support thereof and the welding perimeter being too large and the same throughout the device, which leads to a poor welding and to an almost impossible symmetry.

US 6,644,838 B2, Schefenacker vision system, discloses an intermittent light located at the end of the rear view mirror fitted with a light bulb. Other patents from the same owner disclose a light guide being the transparent cover itself and conducting light from a hidden end to the other one through said outer transparent cover, so that it goes to the rear and out through the other end. This technique is hardly visible by daylight and needs many LEDs in order to compensate this light loss, thus becoming more expensive.

GB 2 275 329 B and US 6,227,689, Donnelly Corporation, are a patent family disclosing several lighting devices with different aims, one of which consists in acting as an intermittent light. Nevertheless the light output is directed to the rear and below the rear view mirror in all cases, as a lower housing cover, and no light core or lighting technique as the one presented herein can be seen, nor any progressive signal combining the front signal and the lower side light.

US 6,264,353 and EP 1 133 411, Lear Automotive, relate to a signal emitted from below the mirror glass which is oriented only to the rear, like Muth.

WO 00/26061, Muth Company, discloses an intermittent light located under the mirror glass not including any lighting core like the one disclosed herein.

A search outside the automobile field has led us to the following documents:

W 98000831B, Philips Electronics, is a luminary made up of a plurality of LEDs with a shape similar to a big light bulb, which is different from what is disclosed herein.

5 WO 00/70687, Osram Opto Semiconductores, relates to a plurality of LEDs with a direct optic next to one another, which is different from what is disclosed herein.

EP 1 255 306 A2, Lumiled Lighting, relates to an optic for diffusing the light from the LED, which is also different from what is disclosed herein.

10 EP 1 296 382 A1, Osram Silvana, is a reflecting system applicable to a very voluminous circular luminary.

WO 00/31708 relates to a plurality of LEDs for traffic signals, said LEDs being flat circuits, traffic lights, etc.

U ES 200102259, Hella, discloses a side signal for buses and the circuit is a flat one having nothing related to the here proposed.

15 Brief summary of the invention

Therefore it is interesting to offer an alternative to the state of the art that overcomes the limitations of the previous documents. In this regard we have not found light beams which are progressively combined in order to illuminate a trace from the infinite to the side of the vehicle and a technique for this light also  
20 applicable outside the automobile field sector consisting in emitting light from a very small volume with a direction moving out 90 ° to the sides of the axis of said device, with elongated reflective means with a collimator and from a core with heat dispersion, which is easy to manufacture, has a low cost and allows to emit a light in an angle that is adapted to the needs of reflection for each use. It  
25 also includes some particular technical details in order to obtain the brightest transparent cover, avoid misting and create a perfect mounting through a laser cutter. Therefore, this innovation is applicable and adaptable to construct any other kind of lightening, and applicable to other low-consumption parts of the vehicle or either useful for home lightening, or for different apparatus, for  
30 example.

The device of the present invention comprises at least:

- A transparent or translucent cover through which said light-emitting core emits an intermittent turn and/or emergency signal, either directly or reflected, forwards, to the side and to the rear, and/or a progressive signal. This cover is preferentially smooth and, as an alternative, presents a second internal, transparent and also smooth cover, although in part it could carry prisms, micro-lenses, engraved or granulated in the form of diffuser, lenses and/or light guides forming a single piece and has a small orifice separated by at least 0.1 mm, forming a thermal air chamber to prevent condensation on the externally visible part of the transparent cover and/or failing this include surface treatment inside the transparent cover, which consists of the application of an adhered transparent polycarbonate film or similar, or transparent polymer or polyurethane paint, having different thermal transmission properties and/or a nanotechnology surface treatment that defines grooves or fine engraving that prevents the accumulation of drops through condensation.

- A metalized reflector and internal body permitting that, in the critical narrowing zone (DC), there are only two thicknesses of the device, the casing body and the transparent cover, permitting a larger corridor of light without increasing the volume in the area towards the rear (8) or the passageway or collimator formed by a reflector elongated to the front over the development of an elongated, stepped parabola or a surface that is almost parallel to the transparent cover, which bears micro surfaces or micro convex mirrors like the slats of a slatted shutter or blind.

- A circuit support or circuit cover that is much smaller when compared to known signal supports, which is a consequence and an advantage of the concept of introducing a circuit in the shape of an arrowhead that pierces and is introduced into the volume of the reflector with a flattened welded perimeter that joins it to the reflector by welding, clips or screws and has cooling fins and teeth that support and retain the circuit and at least one ventilation opening, with a connector fitted directly to the circuit by an aperture and/or a power cable exit with an aerial connector that relates to the rest of the general vehicle electric circuit.

It is characteristic that the circuit is visible externally inside the reflector volume by a prominence or mask with side orifices that facilitate light output,



together with other small frontal cooling orifices (44) and remaining light output to the front. In the case where this cover (3) is not fitted with a series of lenses or a diffuser on the transparent cover (80), the presence thereof is dissimulated by the circuit painted in a color similar to that of the reflector bottom, otherwise  
 5 said cover could be an independent part.

The emission of the white frontal signal produced by white LEDs or by an RGB system that also produces white among other colors, or masked light bulbs or other light source, such as neon, consists of a progressive combination of light beams with a focal centre towards the front and infinite, coinciding with  
 10 the circulation axis to the side floor, with at least two light-emitting cores or beams switching on or off consecutively. The horizontal amplitude of the sidelight at the front or (B-C1) or start of the progressive signal is greater than  $45^\circ$  towards the inside of the vehicle and greater than  $80^\circ$  towards the exterior with reference to the focal centre (P1) or  $0^\circ$  angle and for each side of the  
 15 vehicle, with a minimum light intensity of 1 candela in said centre and greater than 0.01 candela in the rest of the area to light, which vertically comprises at least  $+15^\circ$  and  $-15^\circ$ , but the  $-15^\circ$  are transformed into an angle of more than  $-135^\circ$ , unifying at least more than one core or light-emitting point and the respective beams (B-C2), (B-C3) and (B-C4) that have different emission  
 20 angles in accordance with the requirements in low-speed operations forward and backward, by means of manual or automatic commands. The light source comprises a light-emitting core into which the light-emitting elements, LEDs or multi-chip LEDs, are inserted in a circuit with conducting tracks printed on both sides or, failing this, two parallel circuits with conducting tracks where the LEDs  
 25 are inserted orientated to the exterior and opposite, meaning the light emission direction from said LEDs is in opposite or different directions, producing a light output to the exterior that is partly direct and partly reflected in the collimator.

If the transparent cover formed by one or more windows is over-injected to one part of the rear view mirror, it is normally welded and joined to the  
 30 reflector. In this latter case, the device includes two parts plus the circuit cover and comprises two joining welds; another form includes the transparent cover and body welded to a reflector mounted as a sandwich part, comprising three parts and a weld, or two parts if there is no reflector.

### Graphical description

The various characteristic details of the invention will appear from an exemplary embodiment in accordance with the attached drawings which are merely for non-limiting, guideline purposes.

5 Fig. 1 shows a perspective view of a car's exterior rear view mirror on the casing of which the device proposed by the present invention is mounted. The reflector elongated forwards or collimator is shown coinciding with the zone or focus 1 (F1) and the solid or hollow projector or passageway (8) backwards or focus 2 (F2), together with the high-brightness crystalline perimeter band (1 A) and the light towards the direction (P1) that complements the chamber view  
10 (100) and the core (Z).

Fig. 2 is a perspective view of a vehicle that incorporates the rear view mirror of Fig. 1, where the possible areas to illuminate are indicated.

Fig. 3 shows a horizontal section of a rear view mirror as in Fig. 1, in  
15 which the component elements can be seen: the LEDs with opposite orientations (4), the core (Z) comprising the double-side circuit (7), the light path in function (x1) and (x3), the passageway that, with the transparent cover (1), forms the elongated reflector or collimator and the light from the chamber (100) in a frontal direction (P1).

20 Fig. 4 is a vertical section close-up of the light-emitting core of Fig. 3, located in the mid zone of a rear view mirror.

Fig. 5 is an upper view and section of Fig. 4, in its mid section, with the device in operation and light path towards (x1) and (x2), and the diffuser (80) to prevent the view of the interior circuit as an exemplary embodiment.

25 Fig. 6 shows a vertical section of the illumination device installed on the casing of a rear view mirror, in accordance with Fig. 1, but in the part of the progressive frontal signal, for another exemplary embodiment.

Fig. 7 is a horizontal section like Fig. 3, but with the variation of a flat core, together with reflective means close together, facing the LED focus with an  
30 approximate inclination of 45° to form a back-reflection, with the light path shown, with similar results to the opposite LEDs of Fig. 5.

Fig. 8 is a section like that of Fig. 7, but with an alternative bulb light source, with reflective means and similar results and concept as Fig. 7.

Fig. 9 is a horizontal section of a device with similar concept as the devices of Figs. 7 and 8, but the reflectors are prisms (R) with a similar result of the light emitted in opposite directions from a core, in this case, the circuit (7bis).

Fig. 10 is a section like Fig. 4, but located and integrated into the lower cover of a rear view mirror, with a core cover with upper fins (16).

Figs. 11-A, 11-B and 11-C show close-up sections of various light-emitting variants that are characteristic of the invention, where:

Fig. 11-A is a preformed core (20), with a base (81) and its die-cut contacts (83), it is bent and fixed to another pressure-fit plug-in circuit or base, retained and secured by the stamped and bent metal traces (82), as a repeatable modular core.

Fig. 11-B is a core (20) with an air passageway as a radiator for the two opposite circuits (7) and separated by the said core that bears them.

Fig. 11-C is a core (20), the faces of which are not parallel for two circuits (25) inserted in it; this aperture generates a new face into which an element (5) is inserted that emits light in the dark direction for the other versions of Figs. 11-A and 11-B.

Fig. 12-A shows the concept of light emitted in directions (x1) and (x3), similar to Fig. 11, but from a core or flat circuit (7bis) and through reflection of light from the surfaces (S1) at 45° with respect to the light in the source.

Fig. 12-B is a variant of Fig 12-A, but with the surfaces (S1) separated so that an element (5) can be added that emits light in direction (x2) prior dark zone for the other versions of light emitted in opposite directions.

Fig. 12-C is a preformed module (20) with die-stamped and bent metal traces, with ventilation fins (16) that complements the chamber (110) that carries and emits light in three directions (x1, x2 and x3).

Fig. 13 shows the prism transparent surface (R) in close up as it reflects light at the surface (S1) with an inclination of 45° and a variation of  $\pm 30^\circ$  with

respect to the primary beam (x), producing a deviation of  $90^\circ$  in direction (x1) towards the zone (F2). As a variation of said body (R) it is:

in Fig. 13-A integrated and forming part of the surface (1).

in Fig. 13-B integrated and forming part of the second transparent surface  
5 (30), and

in Fig. 13-C independent.

Fig. 14 is an isometric view of the body (R) where it can be seen that the internal surface (M) is curved with a semi-pipe shape.

Fig. 15 shows details of the concretion of the crystalline perimeter (1-A)  
10 from the limit (L) between the rear view mirror casing (10) and the transparent cover (1) in order to achieve this high-brightness and total transparency effect without any dark zones. Said perimeter comprises a band extending from the limit (L) to the centre of the transparent cover (1) by 10 mm wide for much of its path, establishing a relation between the external (1-A) and internal (1-B)  
15 surfaces, as two surfaces as parallel, flat and smooth as possible; as a maximum, (1-B) has an inclination with respect to (1-A) of less than  $40^\circ$  and if (1-B) is curved, this condition is met by its tangent at a mid point. It can be seen that Figs. 15-A and 15-B produce the crystalline vision (VC) zone, Figs. 15-C and 15-D produce the zone of dark shadow vision (VS), because (1-B) is  
20 inclined by more than  $40^\circ$  and Fig. 15-E produces the dark zone (VS) by external vision of the welding zone (W).

#### Detailed description of an embodiment example

Just as shown by the figures, the present invention concerns an illuminating device with at least some of the previously cited functions A, B, C  
25 and D, applicable to an exterior vehicle rear view mirror, such as the one of Fig. 1, located in the casing (10) of the mirror (12), comprising at least one light-emitting core or source with LEDs and/or an encapsulated LED multi-chip or a group of LED chips inserted directly into the PCB of a circuit with an axial output (4) behind a cover (3) or not. In the case of the circuit being visible from the  
30 exterior, its should be painted in any color that dissimulates its presence, and the transparent cover (1) or (30) will have, at least 10 mm in front of and behind an intersection with the circuit plane, a zone (80), Fig. 5, of interior prisms,

semicylinders that are concave and/or machined or engraved, in order to hide the vision of the circuit from the exterior.

Said core is inserted into a reflector, with its interior face (2) usually metalized or painted in a certain color and closed by at least one translucent or transparent cover (1), through which and by means of the LED (4) source produces at least one function, such as the turn signal forward, to the side and behind a side zone of a vehicle, thus covering areas (F1) or focus 1 to the front and (F2) or focus 2 to the side and behind.

The device also illuminates a frontal zone of the vehicle with a focus (P1) to the front and infinite coinciding with the circulation axis or angle  $0^\circ$  of the vehicle, the intensity of which at this point is always greater than the rest of the illuminated area by the same signal, by means of the light-emitting source (4) and (5) with white, yellow, blue and green light or a combination of at least two of said colors between its various light beams.

The frontal illumination (B-C1) that establishes the width and presence of the vehicle as seen from the front operates permanently, but not the rest of the light beams that are progressively incorporated according to the issued commands; Fig. 2 (B-C2 + B-C3 + B-C4), possibly with other illuminated aperture angles. This light is also a complement of the adjacent chamber (100) which is carried inside or outside said device.

Fig. 3 shows the core circuit (7) of the light source precisely inserted into the reflector volume (2) and, since it is only one sheet, a small cover (50) is enough to support and secure it and from which the direct connector (14) leaves and is taken to the cable (15). The critical distance (D-C13) or narrowing of the mirror plane (12) at its maximum rotation and the small circuit cover make it possible to widen the light path backwards (8) between the transparent cover (1) and the reflector (2), which allows better definition of the signal to the rear in the zone (9) delimited by the surfaces (41) and (42) that can carry a series of micro-optics for this purpose, Figs. 7 and 8. The convergence and non-parallelism of said surfaces enables the light to be directed behind without molesting the driver's eyes and the distance between said planes produce a thickening in the light output to the rear which is transformed into a solid



passageway (R), similar to the hollow passageway (8), with, where possible, both passageways having at least one interior semi-cylindrical or semi-tubular surface (M) with reflective means to better orientate the light towards the rear.

Fig. 3 shows an example of the frontal signal towards (P1), the light-emitting core comprising two circuits fixed to the radiator body (20), with axial LEDs and a third circuit with a frontal LED (5), with the LEDs of a different nature but inside the same core, as shown in Figs. 4 and 5 by means of the LEDs (4) and (4bis), and in the execution of the circuit (7) retained by the teeth (22) with a direct connector (24) which permits the connector (14) to be secured by a clip (26) and be sealed by an elastomer seal (27).

As a variant, instead of including three interconnected circuit faces, the solder traces can be directly formed by a soft metal sheet with treatment that facilitates welding it, and said sheet can be die-stamped, folded and secured to a preformed core (20), just as shown in Fig. 11.

Fig. 4 shows the second transparent surface (30) that forms the air chamber (31) and ventilates through the orifice (32) in order to avoid misting visible from the exterior, complementing the thermal system with the cooling fins (16) and the ventilation orifice (17) or (17b). Unlike this, in Fig. 5 the interior surface of the transparent cover is seen with an adhered non-thermal anti-misting film (33) and completing the anti-misting system with a metal cooling sheet on an interior wall close to the light source as applicable.

Fig. 4 shows an overload protection resistor circuit with at least one resistor R1 (21) and diode D1 (23).

In another exemplary embodiment, the axial and frontal projection of the light emission can be seen in Fig. 6, as well as the way in which the beams are progressively incorporated as when a fan is opened, following order (B-C1), (B-C2) and (B-C3), where (B-C1) is a complement of the chamber (100).

Another exemplary embodiment is the variant of projecting the light to the rear (F2) from a reduced volume, such as the passageway (8), see Fig. 7, by means of a back reflector (40) or (S1), which is part of the reflector piece (2) or an independent part, comprising a flat micro-mirror, slightly curved or parabolic and, in accordance with the required optical study, is inclined to 45°, with a

margin of  $\pm 30^\circ$  with respect to the initial focal plane (x) of the light from the LED or multi-LED, which is applied interposed between said light-emitting element (4) and the transparent cover (1) producing a light deviation close to  $90^\circ$  or path (x1) towards (F2), employing a flat circuit (7bis) and a support cover (50bis),  
 5 which is somewhat larger, but the overall volume in this zone is minimum. It also has the possibility to direct the light towards (F1) with another reflector mirror that is inversely inclined (40bis), symmetrically or almost symmetrically opposite, producing path (x3) towards (F1).

Another way of producing said  $90^\circ$  reflection of the light is to orient the  
 10 output of the same and with the same principle, by optical means through a prismatic body (R) (see Figs 9, 13 and 14), which has a light input surface (P) normal to the initial path (x) of the light generating element (4) to be reflected on the internal surface that is smooth or has micro-prisms (S1) with inclination and shape with respect to path (x2) of the normal light to the surface (1) of  
 15 approximately  $45^\circ$  variable by  $\pm 30^\circ$  (the same concept as for the back-reflector (40) of Fig. 7, 12-A and 12-B). In this case, part of the light forks and follows path (x2) by transparency, equal to the initial (x), and the other part follows path (x1) at  $90^\circ$  with respect to the initial path, towards the focus (F2). In order for said path (x1) to be efficient, the prismatic body (R) is prolonged as necessary  
 20 to the output surface (E) and also has an internal mid surface (M) in said path with a series of reflecting surfaces or internal collimator, with an inclination in accordance with the necessity to transmit the light to the desired angle, said surface (M) being preferably curved forming a semi-cylinder or semi-pipe.

If (R) is an independent body, the surface (S1) can undergo metalizing  
 25 treatment to enhance its reflection.

This body (R) can have another symmetric one oriented in the opposite direction (F1) to emit light in opposite directions from a core having the same shape as the double-side core or circuit and can also be tinted or colored instead of being transparent.

30 Another exemplary embodiment, with the same principle of diverting light from a core in opposite directions (see Fig. 8) is a device with a bulb (45) source, tinted in the regulatory color for the signal or masked by the cover (46)

in order to color the light, which is back-reflected by the cover (48), which comprises an independent piece of heat-resistant material, for example, polycarbonate, folded metal, aluminum or stainless steel in a "Y" or "T" shape, with deployed wings. The reflection surfaces are smooth, flat, parabolic or with  
 5 micro-mirrors and inclined  $45^\circ$  with respect to the light emitted by said bulb, similar to the concept of the visible reflectors and orients the light to  $90^\circ$  in at least one direction towards (F2), with respect to the normal path to the transparent cover (1) of focal centre which said bulb would have to outside the device.

10 The reflectors and cores can be independent, which would allow:

A - them to be fixed to the surface (1) or (30), or to the reflector or internal body (2) by clips or by pressure, glued, hot-stamping, ultrasound or other thermal methods;

15 B - them to be moved without having to redesign the device to obtain precise adjustment of the light output in direction (x1) or (x3);

C – to avoid the dark zone in direction (x2), by means of holes in the back-reflector (44) or by separating the surfaces (S1) the wings or the sides of the core circuits (20), including a light element (5) between the two that emits light towards (x2).

20 Alternatively, said reflectors and cores will form part of the device as part (2) for the mirror (40), or the transparent cover surfaces (1) or (30) for the body (R). In such a case, the light output from the prismatic body and the transparent cover are the same, or the core (20) as a module inserted in another circuit or base.

25 Another exemplary embodiment is shown in Fig. 10, with the upper installed cover (50) and it must be pointed out that the oblique cover of Fig. 4 permits part of the circuit to move outside the reflector volume, facilitating its cooling by the fins (16), with at least one orifice being common (17) or (17bis), with a water drop and expansion chamber (45) for the pressurized water and  
 30 complementing system ventilation with the radiator surfaces (16).

These orifices (17) atmospherically couple the first with the exterior, and the second assembly chamber (31) with the orifice (32), balancing the temperatures of both and thus preventing misting.

Figs. 11 A, B and C are examples of preformed light-emitting cores (20):

5 Fig. 11-A is a preformed core with base (81) to hold another circuit.

Fig. 11-B shows two circuits fixed by hot-stamping to the radiant core (20) with a longitudinal ventilation channel. The LEDs are inserted into the traces (25) on opposite sides, to which the jumpers (52) are connected and which are metalized orifices, the same as the soldered traces, or cables or sheet; various  
10 jumpers are employed because they facilitate thermal conduction from one side to the other for said core. In Fig. 11-C, the radiant core does not have parallel sides, the system aperture is provided by the lower vertex (X) and the circuits are fixed by guides (55) or use die-stamped sheet traces, while a third circuit is presented for the Frontal LED (5), which is the progressive signal (B) in Figs. 1,  
15 3 and 6.

The core (20) may be a metal current conductor and be connected to the traces by said jumpers (52) in order to favor thermal conductivity to an element of greater metal mass. This connectivity is characterized in being the same pole that is connected to the LED or multi-LED cathodes.

20 The circuit tracing may be printed by any deposition, stamping or adhesive system, even directly on the radiant core body (20), or produced using die-stamped sheet and folded so that it encloses said core (20). In that case, it is a molded part with opposite sides having the desired separation, inclination and shape (see Fig. 11-C) or have a base for stable support or inserted by  
25 pressure into a second circuit, such as the resistive protection one or laminar or flat cable and thus be able to laterally move or place several circuits or light-emitting, double-sided cores in parallel over primary support traces or circuit; said sheet traces may be designed with a base for fixing in place by clamping, pressure or soldering to said second base circuit, see Figs. 11-A, 12-C.

30 Depending on the version, the light-emitting elements of any type can have the appropriate optics to provide the light angle required according to a

direction, for example, light concentration optics can be employed in the direction to the rear (F2).

In the circuits into which the light-emitting elements are inserted (LEDs (4) or groups of chip-LEDs or multi-chips), the soldering traces adjacent to the cathode soldering points (C) have at least one 10-mm<sup>2</sup> minimum irregular-shaped surface, represented in a circular area (A1), see Fig. 10.

For minimum expression versions, said core can have light-emitting elements on a single side.

In the device, the functional parts and commands are connected to the vehicle general circuit, including the rotation signal and/or that of the progressive frontal light (B-C-D) and all beams and/or the chamber (100). These can be operated automatically, together with other sidelights and/or the central locking system by means of a remote control and/or the connection of a security or alarm system and/or indirectly as comfort or security lights, together with the interior lighting, and/or boot lights, and/or with the opening of the bonnet or doors.

The device can be operated manually by one or both sides by a switch, which is recommended for various utilities and/or possible auxiliary tasks, such as changing a wheel. Its extra security function is important because it facilitates vision of other drivers of a person working at the side of a vehicle in the dark.

The progressive signal is also switched on by a controller (driver) or data bus, which detects a change of wheel direction and in synchronization with the speed and/or gear to facilitate parking operations, in first and reverse gears at low speed.

The progressive signal is switched on or off through the action of interposed manual or automatic commands from its own dimmer circuit (D), which progressively increases or reduces light intensity for any light function or beam.

The progressive switch on and off is performed by its own controller and/or the same vehicle with an interpolated switch on/off time between one and two minutes to avoid overheating and ensure long device lifetime, said



dimmer or controller adjusting the current for gradual slow switch on and off and/or a remote control with a sensor switch, before automatic switch off is produced by the timer. Another possibility is that the device switches off when first gear is engaged, but the frontal spot remains on (B-C1).

5           The improvement to obtain high brightness with a crystalline perimeter without shadows and the elimination of misting is also achieved by precisely cutting the window around its perimeter (L) with a laser cutter programmed with temperatures of between 1,500°C to over 20,000°C or by a high-pressure water  
10       jet at over 100 bar. It is thus possible to construct a module as a standard unit, with or without a chamber and install it on various rear view mirrors, internally fixing it in place with a perimeter of double-sided adhesive tape (K) in addition to the screws and clips and which also acts as an aerodynamic anti-noise seal. See Figs. 15-A and B.

          Similarly, the use of a progressive light, but horizontally developed with  
15       beams that are summed to enlarge the illuminated field are applicable to other vehicle lights, especially the main headlights and/or the rear lights in combination with parking operations and/or turning the wheels as described above.

          Those skilled in the art would be able to introduce changes and  
20       modifications in the described exemplary embodiments without leaving the scope of the invention in accordance with that defined in the attached claims.